APPENDIX I

Enhanced Contact Systems for Surfaces and Devices
CIP MW 008

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6041.P009z

Background

The system discussed in co-pending application titled "MODIFYING SURFACES OF DEVICES TO INTEGRATE THEM INTO WIRELESS CHARGING SYSTEMS", Attorney Docket No. 6041.P008z, filed 09/17/2002, and the co-pending applications referenced therein requires in some cases that the contacts on the device and its corresponding surface must have a satisfactory contact. In particular, if a device has more than three legs there is, at least theoretically, the chance that one of the legs may not touch. If said non-contacting leg is a contact leg, the non-contact may likely result in a malfunction of the system.

What is clearly needed is a system with a mechanism that by spring-loading or other means allows the contacts to have additional freedom of movement to improve the chances of proper contact between the leg and the matching area on the corresponding surface.

Description of the Embodiment

Figure 1 shows the bottom of a device 100, which could, for example, be a PDA or notebook. The bottom case shell 110 of device 100 has standard rubber feet 101a and 101b. It has also two special contact feet 102a and 102b. A cross section AA of a standard rubber foot 101b is shown in more detail in Figure 2, and a cross section BB of the enhanced foot according to the novel art of this disclosure is shown in Figure 3. It is important to the novel art of this disclosure that feet 102a and 102b have additional freedom in their range of motion so they can move forward and backward as indicated by motion arrow 114, left and right as indicated by motion arrow 113, and vertically as indicated by motion arrow 112. The range of motion indicated by motion arrow 112 is the most important, to guarantee that all four legs, and in particular contact legs 102a and 102b, properly contact the required areas of the corresponding surface.

In some cases, a unit may, as shown in Figure 8, use only two feet (both conductive), as shown in Figure 8a and Figure 8b, or three feet (at least two of which are conductive), as shown in Figure 8c, such that the two conductive feet (indicated by shading in the outline of the feet in Figure 8c) are guaranteed to touch the surface, eliminating the need for flexibility in the z axis.

Figure 2 shows the cross section AA of a standard rubber foot 101b. Typically a holding form or shape is molded into the shell 110. A rubber foot cutout in a matching format 101b is inserted and typically secured with glue (not shown). In some designs other methods of securing the foot to the shell may be employed, such as pins, screws, stakes, wedges, notches, etc.

Figure 3 shows a cross section BB of foot 102a, with motion arrows 112, 113, and 114 showing the range of motion. It is important to the novel art of this disclosure that bottom shell 110 has a holding shape 316 molded to it. Conductive foot material forms a disk 302, which in this example is held back by a bolt 301 and is spring-loaded by spring 303. In other designs, a foam material, for example, may be used instead of a spring. This arrangement allows the required freedom of range of motion indicated by arrows 112, 113, and 114. A gap 314 between the conductive foot 302 and the retainer ring 316 (holding shape) provides space for horizontal range of motion in all directions; while the spring extension 303 provides space for the required vertical range of motion by pushing the bolt head 301 into the device. Also important is wire 315, which connects to bolt 301 and delivers the electricity to the circuitry inside the device (not shown).

Various modifications to the details of this design may be made; for example, multiple springs may be used instead of one spring, or multiple bolts may be used instead of one bolt. Also, the shape of the foot may be triangular, square, elliptic, or any other shape, instead of just round.

Figure 4 shows an enhanced method for low-cost manufacturing of the conductive pad. A small section 400 has four contacts. The pad, depending on its design, may have multiple sections, each with multiple contacts. These contacts may be stamped from a sheet of slightly springy steel 400. There is a cross-connect 401 between the rows and the rows 402a, 402b, etc. In each row is a number of contacts, such as 410a1, 410a2, etc., and 410b1, 410b2, etc. Depending on the size of the total pad, there may be a more, even many more, sections 400, and each section may have its own set of connected contacts, where as neighboring sections are isolated from one another and connect to the controller as described in the earlier applications.

In other cases, the sheet metal may have many other shapes, such as, for example, stamped bumps instead of raised flaps. Also, it may be made of separate pins or rivets that are inserted into the metal sheet, as long as parts of the metal are exposed in the top layer or protrude from it. In yet other cases, the sheet

metal may be molded into the plastic or the plastic may be molded separately and then the metal contacts may be inserted into the plastic. Also, the exposed metal contacts may form an aesthetic pattern, have any of various different sizes and shapes, etc.

Figure 5 shows a side view of the same stainless steel sheet section 400. Cross-connect 401 is at the end and members 402 a-n (all one behind another) are going across, and contacts 410 a-n1, 410 a-n2, etc., are distributed along. Since all contacts in a section line up, they can not be seen individually.

Figure 6 shows a small section with one contact of the sheet 400 in a mold. Cross member 402 a-n rests on distance pins 610 a-n, which are strategically placed throughout the mold. Spring contacts 410 a-n #1-n touch the upper side of the mold at contact points 611 a-n #1-n. Depending on the design, there may be a slight cavity, which will result in a slight protrusion of the contact after the injection is finished.

Cavity 620 is then injected with a specified material. According to the design specifications, the material may be slightly rubbery or somewhat flexible, and it may vary in colors and textures. Cross section 601 is the mold top and cross-section 602 is the mold bottom.

Figure 7 shows the resulting pad 720. The thickness of pad 720 matches the opening of the cavity 620 in Figure 6. Surfaces 410 a-n #1-n protrude on the top side, thus allowing for connection with feet of devices as discussed earlier.

Not shown, for reasons of simplicity and clarity, is the wiring that connects each section of spring steel insert to the controller and power supply of the device, as discussed in previous co-pending, applications. Depending on the number of contact zones, multiple wires may be embedded in the mold, and the mold may have provisions for holding said wires in place during the injection process. In some cases the wiring may be done by having an extended steel frame, similar to the lead frame used in the manufacturing of integrated circuits, rather than attaching wires individually. All the wires carried by those extended lead frames could then terminate at one connector at the side of the finished pad, and could there be connected to a controller and/or a power supply, as described earlier.

Typically the spring metal sheets could be loaded into the mold either manually or automatically. They would then be secured in a certain position with pins such as 610 a-n. Those pins may have additional features, such a protruding smaller pin fitting into a hole in the spring sheet, to ensure absolute, precise positioning. Additional pins may be provided to hold wiring down while the plastic flows into the

mold.

It is clear that many modifications and variations of this embodiment may be made by one skilled in the art without departing from the spirit of the novel art of this disclosure.

The cost advantage of this design is that stamping the steel contacts should result in lower manufacturing costs.

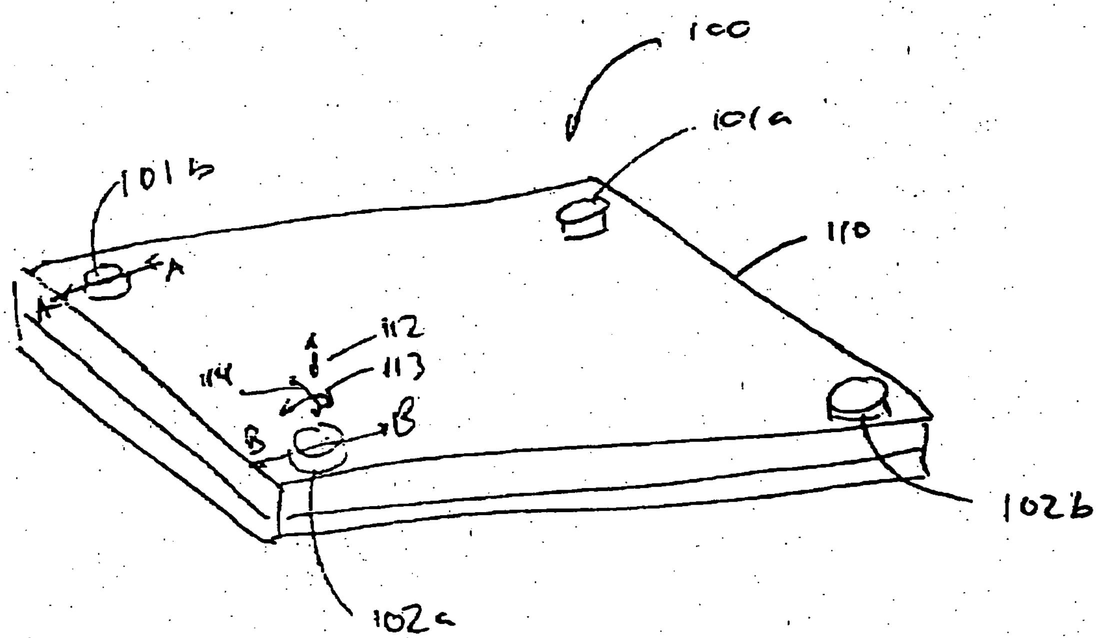


Fig. 1

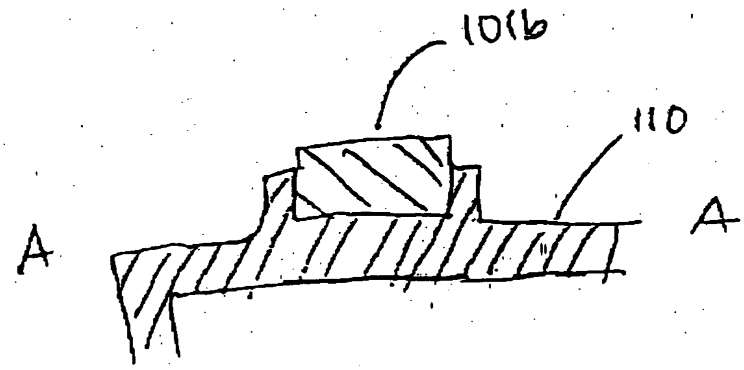


Fig. 2

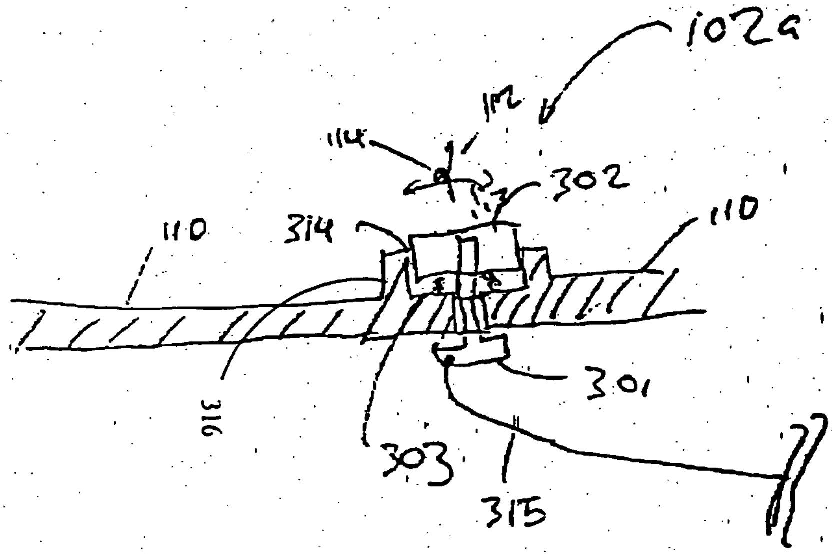


Fig 3

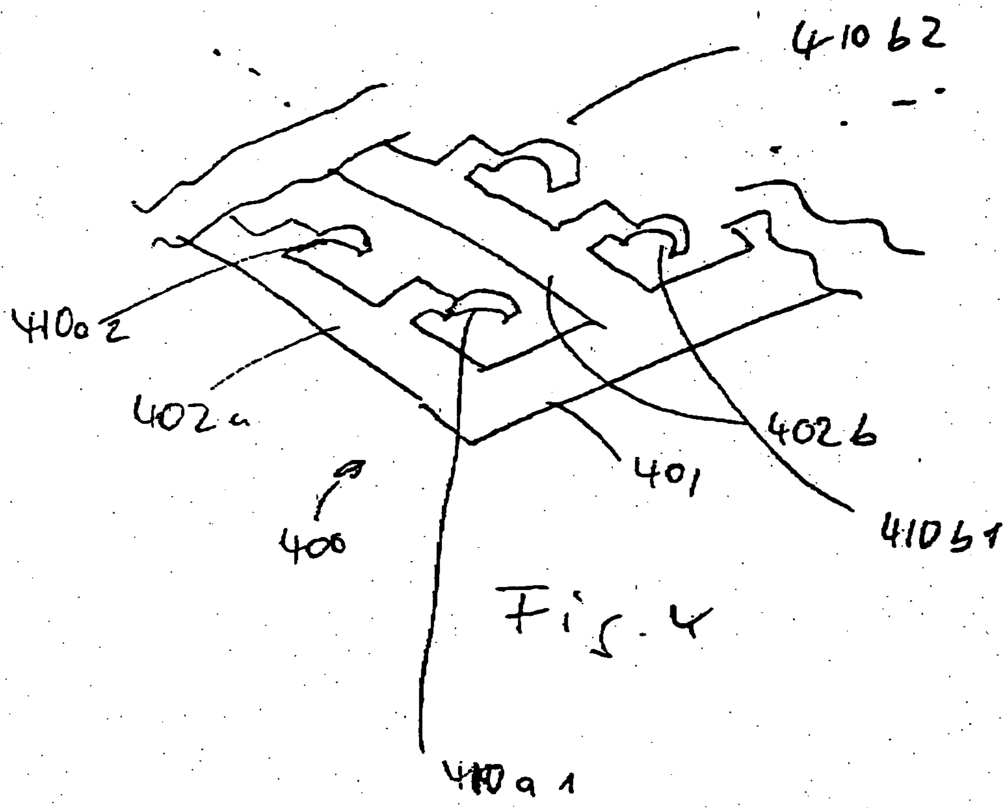


Fig. 4

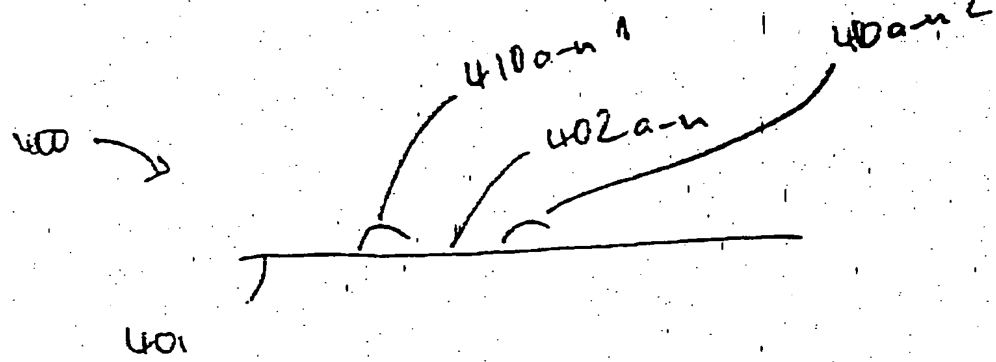


Fig. 5

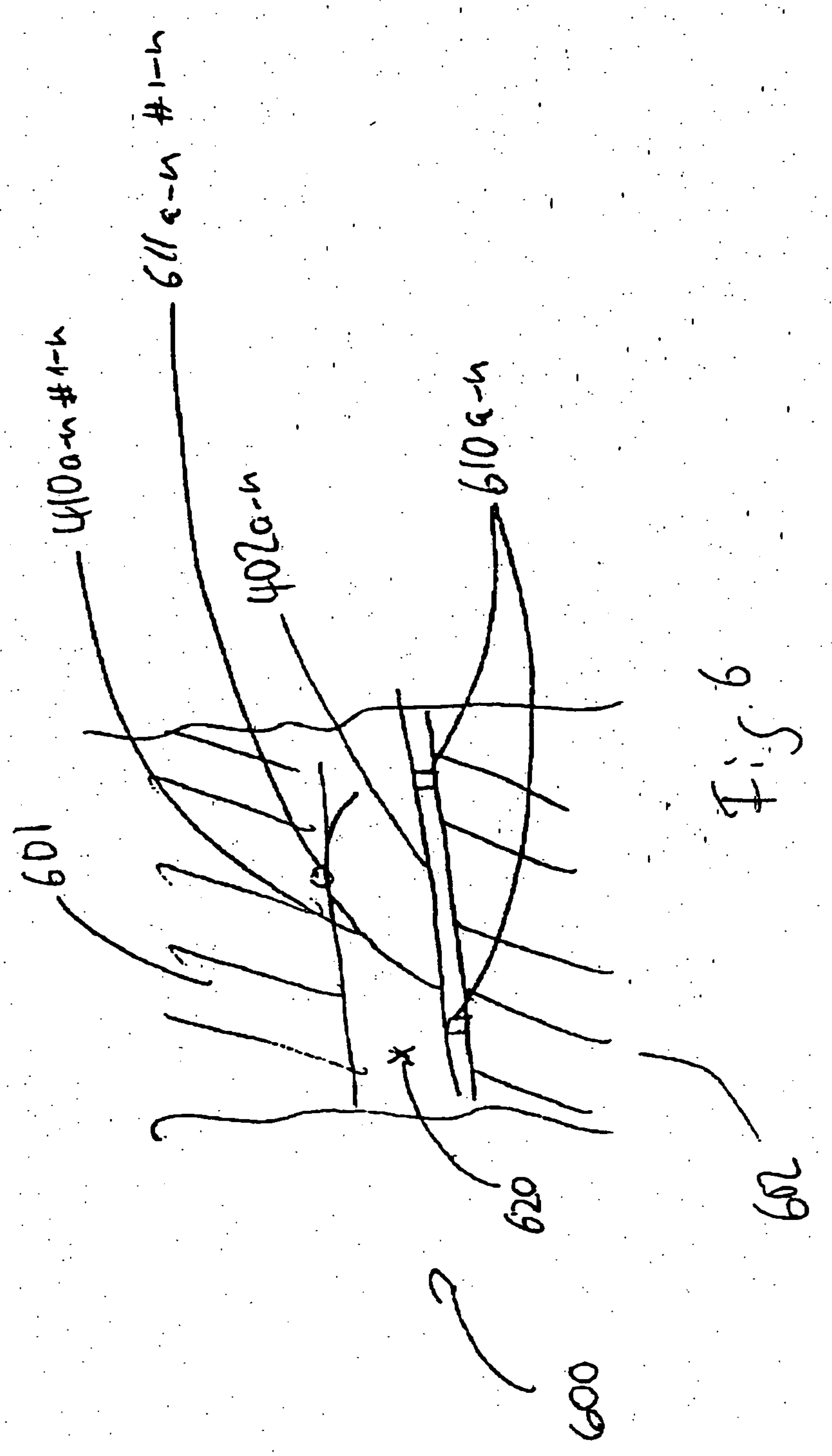


Fig. 6

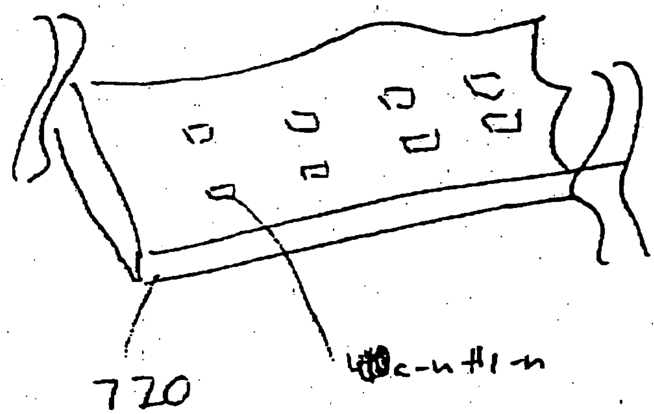


Fig 7

Figure 8b

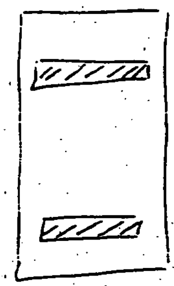
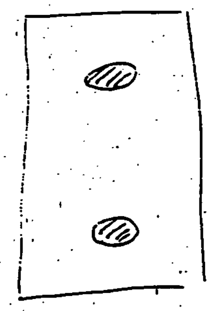


Figure 8a



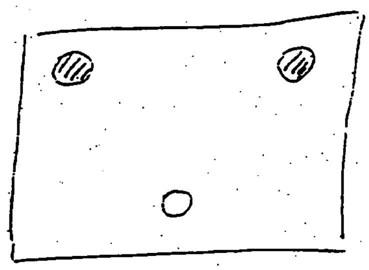


Figure 8c

Figure 8